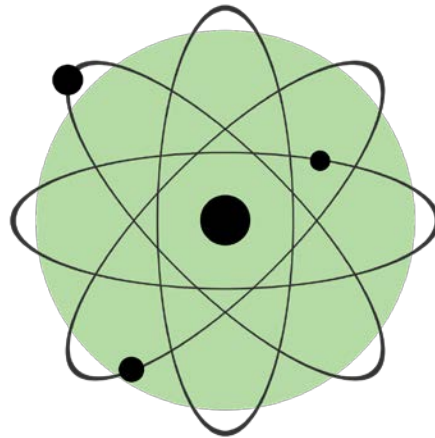


Matter is Everywhere!



Everything around us is made of matter—your clothes, the trees, even the water you drink! We divide matter into four major categories, which are called the four states of matter: liquid, gaseous, solid and plasma. However, we will focus on the first three. Whatever the state of matter may be, all matter is made of tiny particles called atoms. These particles are too tiny to see with the naked eye; they're even too small to see with a regular microscope. If you line up a million atoms next to each other, they will be as thick as a single piece of human hair. So, we can only look at atoms through very powerful tools, one of them being the “scanning tunneling” microscope.

How Do We Know?

We can easily see liquids and solids around us, but most gases aren't visible. We can't see the air around us, but it is still made of atoms that constantly move around freely in space. How can we tell?

Take a balloon, for example. When we pump air into a balloon, it visibly inflates. That means that gaseous matter is filling the balloon and taking up space. The more air we blow into the balloon, the bigger it gets. Therefore, we can observe the way gas moves around space. In the same way, inflatable pool toys also fill with air so that they can float on water. When we fill the plastic shells with air, the toys take shape. Since air is lighter than water, the pool toys can rest on the water without sinking. And then we can enjoy a sunny day while floating in a pool!

Moving Molecules

As we said before, atoms (the molecules present within matter) are constantly moving.

However, molecules move at different speeds within different states of matter. We have been able to determine that molecules move slower in solids than they do in liquids. That's because atoms in solids are tightly packed and there is less space to move around freely. The molecules in gas move the fastest. Since the molecules move more freely in liquids and gases, they can undergo a process called diffusion. (Solids can diffuse as well, although it's a much longer process.) Diffusion is the movement of particles from a higher concentration to a lower concentration. That's why, when you spray perfume in the corner of a room, you will eventually smell it on the other side of the room. The perfume molecules are diffusing through the air molecules, which allows the scent to spread.

Identification

We can identify materials according to a variety of properties. Scientists have determined several different measurements to help label materials. Some examples are temperature, hardness, color and length. Usually, these are used to measure solids, like rocks and minerals. However, temperature can be used to measure liquids as well. When geologists study rocks, they often use the Mohs scale of mineral hardness. This scale allows us to characterize the scratch resistance of various minerals. A diamond is described as hard because it is extremely difficult to scratch. Scientists can measure hardness with the Mohs scale and compare minerals to other minerals.

Scientists always use various methods to group materials together—that way, it's easier to study and compare them. That's another reason why we differentiate between liquids, gases, solids and plasmas!

Name: _____ Date: _____

1. Everything around us is made of

- A** liquids
- B** matter
- C** plasma
- D** gas

2. Why does the author describe the balloon and inflatable pool toys filling up with air?

- A** in order to explain that it is impossible to observe the way gas moves around space
- B** in order to explain that air is not made of atoms that take up space
- C** in order to explain that air is made of atoms that take up space even though air is invisible
- D** in order to prove that these are fun objects to inflate

3. Molecules move slower in solids than they do in liquids. Which evidence from the passage best supports this statement?

- A** Solids, liquids, and gases can all undergo the process of diffusion.
- B** Diffusion is the movement of particles from a higher concentration to a lower concentration.
- C** The molecules in gas move the fastest.
- D** Atoms in solids are more tightly packed than atoms in liquids, so there is less space to move around freely in solids.

4. Based on the passage, the corner where a perfume is initially sprayed has

- A** has no concentration of perfume particles
- B** has the same concentration of perfume particles as the rest of the room
- C** a lower concentration of perfume particles than the other corners of the room
- D** a higher concentration of perfume particles than the other corners of the room

5. What is this passage mainly about?

- A** matter and the properties it has in certain states
- B** the process of diffusion
- C** the different measurement scientists use to label materials
- D** the inflation of balloons and pool toys

6. Read the following sentences from the passage: "Whatever the state of matter may be, all matter is made of tiny particles called atoms. These particles are too tiny to see with the naked eye; they're even too small to see with a regular microscope. If you line up a million atoms next to each other, they will be as thick as **a single piece of human hair.**"

The author uses the example of "**a single piece of human hair**" to illustrate

- A** how atoms can be seen with a regular microscope
- B** how tiny atoms actually are
- C** how hairy atoms actually are
- D** how much they look like hair

7. Choose the answer that best completes the sentence below.

Scientists group materials together _____ it is easier to compare and study them that way.

- A** however
- B** but
- C** although
- D** because

8. Explain why atom molecules move at different speeds depending on whether they are in liquids or solids.

9. What is diffusion?

10. Explain whether smoke filling up a room is diffusion or not.

Teacher Guide & Answers

Passage Reading Level: Lexile 930

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- D gas

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- A however
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- D because**

8. Explain why atom molecules move at different speeds depending on whether they are in liquids or solids.

Suggested answer: Students should indicate that the speed of the atom molecules is determined by the amount of space they have to move in. Molecules move slower in solids than they do in liquids. That's because atoms in solids are tightly packed and there is less space to move around freely.

9. What is diffusion?

Suggested answer: Diffusion is the movement of particles from a higher concentration to a lower concentration.

10. Explain whether smoke filling up a room is diffusion or not.

Suggested answer: Students should argue that smoke filling up a room is diffusion because the smoke particles are moving from an area of high concentration (the area where the smoke is coming from) to low concentration (the areas of the room the smoke is moving towards).